

CARBON BLACK EXTRACTS

CAS Registry Number For Carbon Black: 1333-86-4

Molecular Formula For Carbon Black: N/A

This summary sheet contains information on exposure and health effects of both carbon black and carbon black extracts. Carbon blacks are extremely-fine powdery forms of elemental carbon (HSDB, 1991). They are manufactured by the controlled vapor phase pyrolysis of hydrocarbons (IARC, 1984). The types of carbon blacks include: acetylene black, channel black (no longer produced), furnace black, lampblack, and thermal black. They are insoluble in all solvents including water (HSDB, 1991).

Carbon black extracts are solvent extractions from the carbon blacks. The effectiveness of the extraction depends on the extraction time, solvent, type of carbon black, relationship between sample weight and solvent volume, and amount of extractable material. Polycyclic aromatic hydrocarbons (PAHs) have been detected in benzene and toluene extracts of furnace blacks (IARC, 1984).

SOURCES AND EMISSIONS

A. Sources

The primary use of carbon black is in rubber products, mainly tires and other automotive products. Much smaller amounts of carbon black are used in inks and paints and in the manufacture of dry-cell batteries (IARC, 1996b). The primary stationary sources that have reported emissions of carbon black extracts in California are national security affairs, manufacturing of rubber products, and transportation equipment (ARB, 1997b).

B. Emissions

The total emissions of carbon black extracts from stationary sources in California are estimated to be at least 9,300 pounds per year, based on data reported under the Air Toxics "Hot Spots" Program (AB 2588) (ARB, 1997b).

C. Natural Occurrence

Carbon black extracts are not known to occur as natural products (IARC, 1984).

AMBIENT CONCENTRATIONS

No Air Resources Board data exist for ambient measurements of carbon black extracts.

INDOOR SOURCES AND CONCENTRATIONS

No information about the indoor sources and concentrations of carbon black extracts was found in the readily-available literature.

ATMOSPHERIC PERSISTENCE

Carbon black exists in the particle phase in the atmosphere, hence is subject to wet and dry deposition. The average half-life and lifetime for particles in the atmosphere is estimated to be about 3.5 days, and 5 to 15 days, respectively (Atkinson, 1995; Balkanski et al., 1993).

AB 2588 RISK ASSESSMENT INFORMATION

The Office of Environmental Health Hazard Assessment reviews risk assessments submitted under the Air Toxics “Hot Spots” Program (AB 2588). Of the risk assessments reviewed as of April 1996, carbon black extracts contributed to 12 of the approximately 550 risk assessments reporting a total cancer risk equal to or greater than 1 in 1 million. Carbon black extracts also contributed to the total cancer risk in 4 of the approximately 130 risk assessments reporting a total cancer risk equal to or greater than 10 in 1 million (OEHHA, 1996a).

HEALTH EFFECTS

Probable routes of human exposure to carbon black extracts are inhalation, ingestion, and dermal contact.

Non-Cancer: Health effects of carbon blacks may depend on other combustion products associated with the particles. Symptoms have included cough and eye irritation (NIOSH, 1994). Skin irritation has been reported (IARC, 1984). Recent studies of European carbon black workers reported pulmonary disease hazards due to exposure (Gardiner et al., 1993; Szozda, 1994). Studies in the United States have not found a pulmonary effect, even with exposures in the same range of concentrations (Robertson et al., 1988). Rat studies have reported effects on the lung, including: impaired clearance; alveolar epithelial hyperplasia with increased cell turnover and cell proliferation; inflammation with alveolar proteinosis and many other measures of proteinosis; and squamous cysts (Henderson et al., 1992; Mauderly et al., 1994). Carbon black has hazard characteristics in common with other small airborne particles. Particulate matter smaller than 10 microns are governed by health related ambient air

quality standards. New information shows that such particles at concentrations less than 100 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) may be associated with increases of mortality in general populations (Pope, 1995).

Cancer: Rats studies have recently reported that carbon black with very low organic content produced lung cancer in rats (Heinrich et al., 1995; Mauderly et al., 1994; Nikula et al., 1995). Similar studies reported that DNA adducts in rat lungs are increased by exposure to carbon black (Gallagher et al., 1994; Wolff et al., 1990).

The United States Environmental Protection Agency has not classified carbon black as to its carcinogenic potential. The National Institute for Occupational Safety and Health recommended that carbon black be regulated as a potential human carcinogen and generally recommends that exposures to carcinogens be limited to the lowest feasible concentration. Commercially available carbon black most often has polycyclic organic hydrocarbons adsorbed to it. Some of these compounds are carcinogens (NIOSH, 1994). The International Agency for Research on Cancer has classified the evidence for carcinogenicity of carbon black and carbon black extracts in humans and animals in Group 2B: Possible human carcinogen, based on sufficient evidence in animals (IARC, 1996b).

The State of California has not identified carbon black as a carcinogen under Proposition 65 but has determined that carbon black extracts are carcinogens (CCR, 1996). The preliminary recommended inhalation potency value for use in cancer risk assessments for carbon black extracts is 1.7×10^{-5} (microgram per cubic meter)⁻¹ based on 1 percent PAHs. In other words, the potential excess cancer risk for a person exposed over a lifetime to $1 \mu\text{g}/\text{m}^3$ of carbon black extracts is estimated to be no greater than 17 in 1 million (CAPCOA, 1993).

